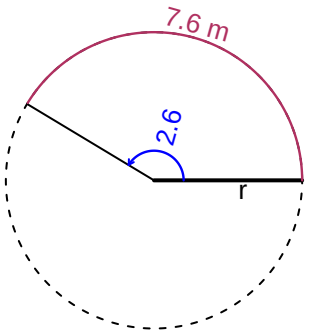
Name: Date:

## Trig Final (SLTN v654)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 7.6 meters. The angle measure is 2.6 radians. How long is the radius in meters?

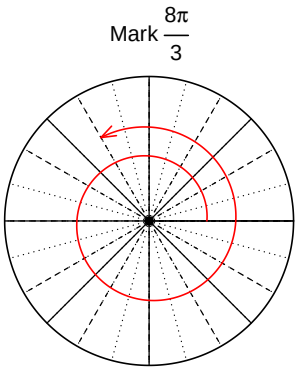



$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

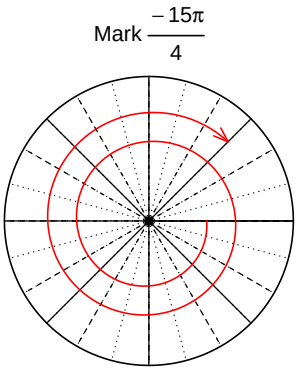
$r = 2.923$ meters.

### Question 2

Consider angles $\frac{8\pi}{3}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{8\pi}{3}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).




Find $\sin(8\pi/3)$




Find $\cos(-15\pi/4)$

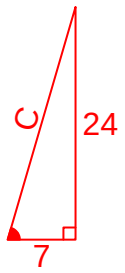
$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

**Question 3**

If $\tan(\theta) = \frac{-24}{7}$, and $\theta$ is in quadrant IV, determine an exact value for $\sin(\theta)$.

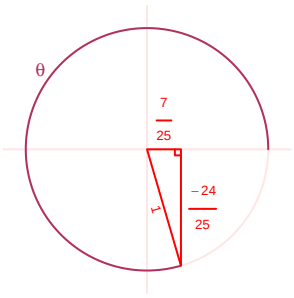
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.




$$\sin(\theta) = \frac{-24}{25}$$

**Question 4**

A mass-spring system oscillates vertically with a midline at $y = 8.56$ meters, an amplitude of 3.27 meters, and a frequency of 5.01 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = 3.27\sin(2\pi 5.01t) + 8.56$$

or

$$y = 3.27\sin(10.02\pi t) + 8.56$$

or

$$y = 3.27\sin(31.48t) + 8.56$$